

DaimlerChrysler AG  
Stuttgart

Patent Claims

- 5
1. Process for producing a catalytic converter, in which catalytically active material is electrochemically deposited on a substrate (4) by immersing the substrate (4) in an electrolyte (5) which contains the catalytically active material (6) and applying voltage between the substrate (4) and a counterelectrode (3), characterized in that the catalytically active material (6, 6.1) is deposited on a metal substrate (4) as a result of the substrate (4) which is to be coated being acted on by current or voltage pulses of predetermined amplitude and/or frequency, the catalytically active material (6, 6.1) being directly securely joined to the substrate (4).
- 10
- 15
- 20
2. Process according to Claim 1, characterized in that the catalytically active material (6, 6.1) is deposited on a metallic substrate (4), in that an electric direct voltage ( $V_{dc}$ ) on which an alternating voltage ( $V_{ac}$ ) is superimposed is applied between substrate (4) and counterelectrode (3), and in that the catalytically active material (6, 6.1) is deposited on the substrate (4) as a porous or non-cohesive layer.
- 25
- 30
3. Process according to Claim 1, characterized in that the direct voltage ( $V_{dc}$ ) at least corresponds to the deposition potential of the catalytically active material (6, 6.1).
- 35
4. Process according to Claim 2, characterized in that the voltage swing ( $V_{PP}$ ) of the alternating

voltage ( $V_{ac}$ ) is lower than the direct voltage ( $V_{dc}$ ).

5. Process according to Claim 1, characterized in that the substrate (4) is provided, on its surface (4.1) which is to be coated, with a predetermined surface roughness prior to the deposition.
6. Process according to Claim 5, characterized in that the surface roughness is in the range from 0.3  $\mu\text{m}$  to 10  $\mu\text{m}$ .
7. Process according to Claim 1, characterized in that the catalytically active material (6) is deposited as substantially spherical metal clusters (6.1) as a result of the alternating voltage component ( $V_{ac}$ ) being applied with a frequency of over 50 Hz.
8. Process according to Claim 1, characterized in that the catalytically active material (6) is deposited as substantially dendritic metal clusters (6.1) as a result of the alternating voltage component ( $V_{ac}$ ) being applied with a frequency of between 5 and 50 Hz.
9. Process according to Claim 1, characterized in that the catalytically active material (6) used is a precious metal or a mixture of precious metals and/or catalytically active materials.
10. Process according to Claim 1 or 2, characterized in that substantially spherical platinum clusters are deposited on a stainless steel substrate from a solution of a platinum compound in 0.1 M  $\text{H}_2\text{SO}_4$  with a platinum content of approximately 0.1 g/l as a result of a modulated voltage comprising a direct voltage ( $V_{dc}$ ) of approximately 1.3 volts

superimposed with an alternating voltage ( $V_{ac}$ ) with a voltage swing ( $V_{pp}$ ) of 0.3-1 volt and a frequency of 50-100 Hz being applied between stainless steel substrate (4) and counterelectrode (3).

- 5
11. Process according to Claim 1 or 2, characterized in that substantially dendritic platinum clusters are deposited on a stainless steel substrate from a solution of a platinum compound in 0.1 M  $H_2SO_4$  with a platinum content of approximately 0.1 g/l as a result of a modulated voltage comprising a direct voltage ( $V_{dc}$ ) of approximately 1.3 volts superimposed with an alternating voltage ( $V_{ac}$ ) with a voltage swing ( $V_{pp}$ ) of 0.3-1 volt and a frequency of 5-15 Hz being applied between stainless steel substrate (4) and counterelectrode (3).
- 10
12. Process according to Claim 1 or 2, characterized in that substantially dendritic rhodium clusters are deposited on a stainless steel substrate (4) from a solution of a rhodium compound in 0.1 M  $H_2SO_4$  with a rhodium content of approximately 0.2 g/l as a result of a direct voltage ( $V_{dc}$ ) of 1.4-1.6 volt being applied between stainless steel substrate and counterelectrode (3) and an alternating voltage ( $V_{ac}$ ) with a voltage swing ( $V_{pp}$ ) of 0.3-1.5 volts and a frequency of 5-15 Hz being superimposed.
- 15
- 20
- 25
- 30
13. Process according to Claim 9 or 10, characterized in that the size of the platinum clusters is between 2 nm and 1  $\mu m$ .
- 35
14. Process according to Claim 1, characterized in that the counterelectrode (3) is formed by platinum-coated titanium.

15. Catalytic converter in a fuel cell system which is produced as described in one of claims 1 to 14.
  16. Catalytic converter in an exhaust-gas cleaning system in a motor vehicle which is produced as described in one of Claims 1 to 14.
- 5

Add  
A1